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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/846,423	04/30/2001	Gregory Sharat Lin	PHA 009002	4584

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EXAMINER

SUNG, CHRISTINE

ART UNIT PAPER NUMBER

2878

DATE MAILED: 04/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/846,423

Applicant(s)

LIN ET AL.

Examiner

Christine Sung

Art Unit

2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 April 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-72 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☒ Claim(s) 6, 13, 17, 22, 28, 33, 38, 44, 48, 54, 58, 63, 66 and 72 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 April 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4, 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Continuation of Disposition of Claims: Claims rejected are 1-5,7-12,14-16,18-21,23-27,29-32,34-37,39-43,45-47,49-53,55-57,59-62,64,65 and 67-71

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following informalities: On page 12, line 5, the specification reads "sensing logic 254" which should read --sensing logic 234--.

Appropriate correction is required.

### *Drawings*

2. The drawings are objected to because in figure 1A is missing the part of the drawing of the scattered path, which is depicted by element 114. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: Element 112, on page 11. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: Figure 1B, element 117; Figure 1C, elements 117 and 118; Figure 2, element 200; Figure 3B, element 360; Figure 4A, element 400; Figure 4D, element 442; Figure 5, element 500; Figure 6B, elements 601 and 620; Figure 7, element 700; and Figure 8, element 832.

A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

***Claim Objections***

4. Claims 4, 15, 25, 36, 46 and 56 are objected to because of the following informalities: These claims state "...wherein no physical collimator is used to collimate said incident photons." This sentence causes confusion because it can be interpreted in two ways; either that the device doesn't collimate at all or that radiation undergoes collimation but without the use of a collimator. Based upon the subsequent claims, the examiner interprets the above-mentioned claims to mean the latter; that the collimation is done without the use of a collimator. In order to avoid future misinterpretation of the claims, the examiner respectfully requests that the claims be amended to alleviate the confusion. For example, the claims could read, "...wherein the incident photons are collimated without the use of a physical collimator." Appropriate correction is required.

The balance of claims 5, 6, 16, 17, 26, 27, 28, 37-38, 47-48, and 57-58 are objected to for being dependent on an already objected claim.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-3, 7-8, 12, 14, 18-19, 21, 23-24, 29-30, 32, 34-35, 39-40 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Cree et al. (*Towards Direct Reconstruction from a Gamma Camera Based on Compton Scattering*).

Regarding claims 1, 2, 14, 23, 24, 34 and 35 Cree et al. discloses a first and second detection layer, wherein the layers may include an array of detectors or pixels (Figure 1 a) for detecting events resulting from incident photons; a method of determining the positions of events in each of the first and second detection layers (Pg 399, 2<sup>nd</sup> column, first paragraph); a method of detecting coincident pairs of events resulting from Compton scattering (abstract and page 400, column 1, first paragraph); a method of processing or forward projecting or back projecting the data from the first and second detection layers (Pg 399, 2<sup>nd</sup> column, first paragraph); the use of a deconvolution function or a mathematical logic to localize the source locations of the incident photons based on the distributions of the events (See pages 400-401); and using the source locations to reconstruct and image of an object (Pg 400, 1<sup>st</sup> column, first paragraph). Although Cree et al. does not specifically disclose the use of a position sensing logic, or a coincidence detector or a processing logic, it is inherent that the corresponding apparatuses must be used in order to obtain the necessary information. Further Cree et al. discloses that the deconvolution function is performed on the data resulting from the specific detection layers.

Regarding claim 3, Cree et al. further discloses that a scattering angle is compute for the detected pairs of coincident events (See figure 2b and pages 400-401).

Regarding claims 7, 8, 18, 19, 29, 30, 39 and 40 Cree et al. discloses using a semiconductor array for either or both detectors (Pg 399, Column 1, 1<sup>st</sup> paragraph).

Regarding claims 12, 21, 32, 43 Cree et al. discloses that a device is used to reject photons subjected to multiple Compton scattering (Pg 399, column 2, 2<sup>nd</sup> paragraph).

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 4-5, 9-11, 15-16, 20, 25, 26, 27, 31, 36, 37, 41, 43, 45-47, 49-53, 64-65, and 67-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cree et al. (*Towards Direct Reconstruction from a Gamma Camera Based on Compton Scattering*).

Regarding claims 4, 15, 25, 36, 46, 64 and 67, Cree et al. discloses the use of an Anger camera without a collimator as a detection layer (Pg 399, 1<sup>st</sup> column, first paragraph). Although Cree et al. does not specifically disclose the use of this detection layer as the first detection layer, he does not exclude it from being used. Further, Cree also discloses that the use of collimators in similar detection apparatuses causes a severe limitation on performance (Pg 398 1<sup>st</sup> column,

second paragraph). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used this non-collimating layer as the first layer so as to increase the performance of the detector.

Regarding claims 5, 16, 27, 37, 47 and 65 Cree et al. discloses using an Anger camera for performing SPECT (Pg 398, 1<sup>st</sup> paragraph, second column).

Regarding claims 9-11, 20, 31, 41, 49-51, 68-70, the disclosed types of detectors are well known in the art to be equivalent to the ones disclosed by Cree et al. on page 399, column 1, first paragraph. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used any of the described types of detectors, such as the solid state arrays disclosed, because the functioning of the apparatus remains the same.

Regarding claim 26, Cree et al. discloses that the second detection layer is disposed to receive the photons that have undergone Compton scattering in the first detection layer (Pg 398, last paragraph-399, first paragraph).

Regarding claim 45, Cree et al. discloses a first and second detection layer, wherein the layers may include an array of detectors or pixels (Figure 1 a) for detecting events resulting from incident photons; a method of determining the positions of events in each of the first and second detection layers (Pg 399, 2<sup>nd</sup> column, first paragraph); a method of detecting coincident pairs of events resulting from Compton scattering (abstract and page 400, column 1, first paragraph); a method of processing or forward projecting the data from the first and second detection layers (Pg 399, 2<sup>nd</sup> column, first paragraph); the use of a deconvolution function or a mathematical logic to localize the source locations of the incident photons based on the distributions of the events (See pages 400-401); using the source locations to reconstruct an image of an object (Pg

400, 1<sup>st</sup> column, first paragraph); and computing the scattering angles for pairs of events (See figure 1,  $\theta$  and Pg 400). Although Cree et al. does not specifically disclose the use of a position sensing logic, or a coincidence detector or a processing logic, or a memory it is inherent that the corresponding apparatuses must be used in order to obtain and store the necessary information. Further Cree et al. discloses that the deconvolution function is performed on the data resulting from the specific detection layers.

Regarding claims 42 and 52, Cree et al. discloses using measuring the energy of the events, but does not specifically disclose the use of a pulse height analyzer to measure the energy (Pg 399, first column, first paragraph). Although Cree et al. does not specifically disclose the use of the analyzer, it is well known in the art to use a pulse height analyzer to measure the energy of a given set of data.

Regarding claims 53 and 71, as disclosed above, Cree et al. discloses that a device is used to reject photons subjected to multiple Compton scattering (Pg 399, column 2, 2<sup>nd</sup> paragraph).

10. Claims 55-57 and 59-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cree et al. (*Towards Direct Reconstruction from a Gamma Camera Based on Compton Scattering*) in view of Tumer (US Patent 5,821,541).

Regarding claim 55, Cree et al. discloses a first and second detection layer, wherein the layers may include an array of detectors or pixels (Figure 1 a) for detecting events resulting from incident photons; a method of determining the positions of events in each of the first and second detection layers (Pg 399, 2<sup>nd</sup> column, first paragraph); a method of detecting coincident pairs of events resulting from Compton scattering (abstract and page 400, column 1, first paragraph); a method of processing or forward projecting the data from the first and second detection layers

(Pg 399, 2<sup>nd</sup> column, first paragraph); the use of a deconvolution function or a mathematical logic to localize the source locations of the incident photons based on the distributions of the events (See pages 400-401); using the source locations to reconstruct and image of an object (Pg 400, 1<sup>st</sup> column, first paragraph); and computing the scattering angles for pairs of events (See figure 1,  $\theta$  and Pg 400). Although Cree et al. does not specifically disclose the use of a position sensing logic, or a coincidence detector or a processing logic, or a memory it is inherent that the corresponding apparatuses must be used in order to obtain and store the necessary information. Further Cree et al. discloses that the deconvolution function is performed on the data resulting from the specific detection layers. Cree does not disclose the use of an amplifier or the conversion of the detected signals from analog to digital. Tumer discloses an amplifier that magnifies the output from the detectors (Column 26, lines 10-16) and further discloses the conversion of the signals from analog to digital signals (Column 27, lines 28-35). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used an amplifier and analog to digital converter as it has been well known in the art to use these devices to enhance and increase data accuracy.

As mentioned above, the limitations set forth in claims 56-57 and 59-62 have been disclosed in the abovementioned paragraphs.

***Allowable Subject Matter***

11. Claims 6, 13, 17, 22, 28, 33, 38, 44, 48, 54, 58, 63, 66 and 72 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 13, 22, 33, 44, 54, 63 and 72, none of the prior art of record discloses measuring the absorbed energy of the detected events to validate the computed Compton scattering angles. Although Cree et al. discloses measuring the absorbed energy, and calculating the Compton scattering angles, it does not disclose the specific relationship of validating the angles using the measured energy.

Regarding claims 6, 17, 28, 38, 48, 58 and 66, none of the prior art of record discloses a processing logic that is configured to collimate incident photons without the use of a physical collimator. Although it is well known in the art to use physical collimators to direct radiation to a certain direction, the prior art of record does not disclose the use of electronic collimation.

### *Conclusion*

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Sung whose telephone number is 703-305-0382. The examiner can normally be reached on Monday- Friday 7-4 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 703-308-4852. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-0956 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

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CS

April 7, 2003

A handwritten signature in black ink, appearing to read 'D. Porta', with a long horizontal stroke extending to the right.

**DAVID PORTA**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 2800**